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THE EFFECT OF EMOTION ON WORD RECOGNITION

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Many years has been spent in the researches on explanatory concepts of perceptual sensitization and defense, and the disputes on "subception" as one of those concepts (Eriksen, 1956, 1959, 1960; Lazarus, 1956) are still very active.

After McCleary & Lazarus (1949, 1951) had begun to propose "subception," Osgood (1957) and Dixon (1958) have supported it on the basis of the function of the autonomic system, but Eriksen (1956, 1959, 1960) has failed to support it experimentally and theoretically. Eriksen has concluded that "the subception is real enough" and has referred to "the limitations of verbal responses in conveying the individual's perceptual experiences," "sources of noncorrelated errors between two or more concurrent response systems," and "some of the factors that will lead to increase in noncorrelated errors between concurrent responses" (1960, p. 290), as factors of subception effect, and he has been investigating into these factors, and has believed that among these variables are inconcluded a number of verbal response categories. His theory may explain the relationship between two or more concurrent response systems, but it fails to explain the relationship between response systems that arise from different stimuli; e. g. when emotion arises in no connection with the stimulus for recognition and still the emotion effect is shown on the recognition.

Easterbrook (1959) has studied on the relationship between emotion and "range of cue utilization" in order to explain perceptual sensitization and defense. But, it does not seem to be satisfactory because only negative emotion is considered.

In our present experiments, *S*s were given recognition stimuli (word stimuli) which were distinct from emotion stimuli. Here our design is different from Eriksen's (1956). Second, our experiments used two types of emotion (positive and negative). Here we are different from Easterbrook's (1959).

METHOD

Exp. I was done as a control with respect to verbal stimuli. Ninety neutral words with familiarity values 3.50—3.99 (Koyanagi, *et al.*, 1960) which consisted of 3 Japanese letters each, were divided nearly at random into two lists (A and B), and each list was further divided into 3 word lists. Each word in these word lists was matched with different temporal durations and was presented tachistoscopically with an inter-trial interval of 20 seconds by the method of constant stimuli. The experiment was conducted for three sessions; each session consisted of 30 trials and the order of word presentation was nearly randomized. A two minute break intervened between the sessions. Prior to experiment, 10 words (different from those used in the experiment) were presented for training in order to see a rough measure of *S*'s scope of recognition.

The word stimuli used were アチラ achira (there, yonder), エホン ehon (a picture book), ヒレイ hirei (proportion), ノコリ nokori (the remainings), タニマ tanima (a ravine), etc.

Instruction and stimulus signals were given by the tape-recorder. Nine adult subjects (seven males and two females) were used.

In Exp. II, a threatening sentence-stimulus was given auditorily five seconds prior to the presentation of each word of the A word list, and a neutral sentence stimulus was likewise given five seconds prior to the

presentation of each of the B word list. These stimulus sentences were very short and were all different. Thus, there were 45 threatening sentences, and 45 neutral sentences. These sentences were matched to the words nearly at random, needless to say. Examples of the threatening sentences were "What a pity! A child is dead." "Ouch! My fingers were caught in the door." "Oh! All my teeth falled out." Some of the neutral sentences were "Weight is measured by a weighing machine." "A triangle has three angles." and "The body heat is 37°C." These sentence-stimuli were presented by the tape-recorder.

The *Ss* used were 45 adults, composing of 27 males and 18 females.

Exp. III was identical in procedure to Exp. II except that the light-source of the tachistoscope was entirely renewed. The *Ss* were 18 (10 males and 8 females).

Exp. IV was done soon after Exp. III with different *Ss* (19 males and two females). In Exp. IV were used photo-stimuli in place of sentence-stimuli. The stimuli consisted of 60 photos, 30 sexual and 30 neutral. Number of the emotional stimuli (here, photos) was 60 rather than 90 as in Exps. II and III since it was found that too many similar sexual photos decrease emotional effect by adaptation. Thus, only grey sheets in place of photos were used in seessional, and the photos were used only in sessions 2 and 3.

In order to assess the emotional value of our emotional stimuli (sentences and photos), 111 *Ss* (72 males, and 39 females) was asked to rate these and neutral stimuli with a 4 point emotional scale.

All the subject used through the experiments were junior students in our university. They were naive with respect to the experiments.

Results and Discussion

Table 1 shows the mean word recognition thresholds in Exp. I. Analysis of variance of the data shows that the mean recognition thresholds decrease in parallel with respect to the two word lists (an F for Word list $\times$ Session is below 1, df = 2 and 16), and also that the main effect based on the word list is not statistically significant (an F is below 1, df = 1 and 8). Thus the two word lists failed to show any significant difference in recognition in the present set-up.

The results in Exp. II are shown in Tables 2 and 3, which indicate that mean recognition threshold of the words following the neutral sentence-stimuli decreases from sessions 1 to 3 by training effect as in Exp. I, but the mean recognition threshold following the threatening sentence-stimuli increases in session 3 which indicates perceptual defense.

Table 1. Mean Recognition Thresholds in 100 msec. Units without Emotional Stimuli (Exp. I) N=19

Word List	Session			Mean
	1	2	3	
A	46.9	34.3	33.9	38.37
B	47.3	34.4	32.4	38.03

Table 2. Mean Recognition Thresholds in 100 msec. Units with Threatening Stimuli (Exp. II)

Sex	N	Condition	Session			Mean
			1	2	3	
M	27	Threatening	45.5	38.5	41.6	41.87
		Neutral	47.1	40.1	37.0	41.05
F	18	Threatening	41.8	33.4	36.1	37.10
		Neutral	40.3	35.6	27.9	34.60

Note: There was a significant difference at the 1% level between the two stimuli in session 3 ($t = 3.532$ df $= 26$ for male; $t = 2.990$ df $= 17$ for female)

As the sex difference was not statistically significant as shown in Table 3, no further analysis will be made with respect to it.

Table 3. Analysis of Variance Based on Table 2.

Source	SS	df	MS	F
Sex	2639.89	1	2639.890	2.002
Condition	79.95	1	79.950	4.968*
Session	2723.39	2	1361.695	16.374**
Sex × Cond.	73.75	1	73.750	1.639
Sex × Sess.	177.87	2	88.935	1.977
Cond. × Sess.	894.83	2	447.415	9.946**
Sex × Cond. × Sess.	37.89	2	18.945	——
Subject	56696.39	43	1318.521	15.866**
Cond. × Subj.	1383.93	43	32.184	——
Sess. × Subj.	3576.07	86	41.582	——
Cond. × Sess. × Subj.	3868.65	86	44.984	
	72152.61	269		

Table 4. Mean Recognition Thresholds in 100 msec. Units with Threatening Stimuli (Exp. II) N=18

Condition	Session			Mean
	1	2	3*	
Threatening	38.4	36.7	38.9	38.00
Neutral	39.9	37.6	35.1	37.53

* The difference between the two means was ssgnificant at the 5% level in session 3 (t=2.30 df=17).

The results in Exp. III are shown in Table 4. It is very similar to those in Exp. II which was done under almost identical conditions to those in Exp. II. Thus the two results were combined and analysis of variance was applied (Table 5). The table shows an insignificant difference between the two experiments and thus the finding (perceptual defense) in Exp. II was confirmed in Exp. III.

Table 5. Total Analysis of Variance Based on Exp. II and Exp. III.

Source	SS	df	MS	F
Experiment	1297.84	1	1297.84	1.384
Condition	7.17	1	7.17	——
Session	1220.47	2	610.235	17.514**
Exp. × Cond.	1.09	1	1.09	——
Exp. × Sess.	248.01	2	124.005	2.765
Cond. × Sess.	554.36	2	277.18	6.049**
Exp. × Cond. × Sess.	17.91	2	8.955	——
Subject	40337.52	43	938.082	20.919**
Cond. × Snbj.	923.57	43	21.478	——
Sess. × Subj.	2996.52	86	34.843	——
Cond. × Sess. × Subj.	3484.40	86	44.843	
	51088.67	269		

Table 6. Mean Recognition Threshold in 100 msec. Units with Sexual Stimuli (Exp. IV) N=21

Condition	Session		Mean
	2*	4	
Sexual	32.1	32.5	32.30
Neutral	34.9	33.0	33.95

The results in Exp. IV are shown in Table 6. As Exps. III and IV were conducted in temporal session, the two results were pooled and analysis of variance was applied for sessions 2 and 3, since the photo-stimuli were presented only for these two sessions. The results suggest that the word recognition threshold is lower (perceptual sensitization) in Exp. IV

Table 7. Total Analysis of Variance Based on Exp. III and Exp. IV.

Source	SS	df	MS	F
Experiment	608.67	1	608.67	1.682
Condition	1.64	1	1.64	——
Session	8.34	1	8.31	——
Exp. × Cond.	94.05	1	94.05	5.979*
Exp. × Sess.	3.47	1	3.47	——
Cond. × Sess.	108.33	1	108.33	6.887*
Exp. × Cond. × Sess.	13.66	1	13.66	——
Subject	13389.69	37	361.88	23.006**
Cond. × Subj.	649.31	37	17.55	1.116
Sess. × Subj.	1230.22	37	33.25	2.114*
Cond. × Sess. × Subj.	582.01	37	15.73	
	16689.36	155		

as compared with that in Exp. III (perceptual defense) and also that the positive emotional effect appears early in session but the negative emotional effect late in session. The latter is probably because the photo-stimuli are visual and thus are direct, while the sentence-stimuli are auditory and thus indirect.

Table 8. Mean Rating Scores for the Emotional Stimuli

Sex	N	Condition	Session			Mean
			1	2	3	
M	72	Threatening	2.77	2.86	2.64	2.76
		Neutral	1.39	1.42	1.25	1.35
F	39	Threatening	2.62	2.99	2.56	2.76
		Neutral	1.22	1.10	1.10	1.13

Table 8 shows the mean rating scores for the emotional stimuli. As there are considerable differences between the emotional and neutral stimuli, it may be stated that the *Ss* had experienced high emotion in the cases (threatening and sexual).

Our results may be explained in that the positive (sexual) emotion organizes and accelerates the cognitive process and thus yields perceptual sensitization while the negative

(threatening) emotion disorganizes and represses the cognitive process and thus perceptual defense results. Our emotional conditions may be considered to be highly related to GSR or autonomic response, as in the study by Lazarus & McCleary (1951) and Dixon (1958). And our emotional situation may be considered to be a function of the lower brain centers (Osgood, 1957). And also it is identical to Easterbrook's concept of emotion which affects the "range of cue utilization." However Easterbrook's concept can not explain perceptual sensitization, although it can explain perceptual defense.

Eriksen (1959, 1960) has assumed that the "subception-like effect" is real and it is explained by "partial correlation" between stimulus and GSR (emotion), and has tried to consider it in terms of supraliminal perception rather than in terms of subliminal perceptions. Eriksen's theory of partial correlation can explain the following relation,

$$\text{Stimulus-Perceptual Process} \begin{cases} \text{Verbal Response} \\ \text{GSR} \end{cases}$$

but it can not explain the relationship when the word-stimuli are different from the emotional stimuli.

Our results clearly show that the drive (emotion) which motivates approach-response and acquisition-response, accelerates the cognitive process, but the drive (emotion) which motivates escape-response and avoidance-response, represses the cognitive process, and our theory can be applied to the findings which the New Look psychologists have accumulated past many years on perceptual defense against unpleasant, anxious and threatening stimuli (McGinnies, 1949; Stein, 1953; Nelson, 1955) and perceptual sensitization (Postman, Bruner, and McGinnies, 1948; Mausner & Siegel, 1950) or accentuation (Bruner & Goodman, 1947; Beams, 1954) for food, opposite sex, and other wanted objects. Our theory assumes the function of the autonomic system or the lower brain centers as in the studies by Lazarus, Osgood, and Dixon.

Summary and Conclusions

In Exp. I, the recognition threshold was measured for two neutral word lists, 45 words each, through three sessions an inter-session interval of two minutes by the method of constant stimuli.

The results indicate that the mean recognition threshold decreased parallelly for the two lists, and that there was not a significant difference among them. Thus, each word of the one list was presented after the threatening sentence-stimuli, and each word of the other list after the neutral sentence-stimuli.

It was found that the mean recognition threshold was greater after the threatening stimuli than after the neutral. The results were confirmed in Exp. III. Perceptual sensitization or facilitation of word recognition was found in Exp. IV when the emotional (sexual) photo stimuli were given prior to presentation of recognition words. The present findings show that, when positive emotion arises, the following cognitive process is accelerated, while, when negative emotion arises, the process is repressed.

Our results can not be explained either by Eriksen's partial correlation theory or by Easterbrook's "range of cue utilization," but they confirm the previous assumptions on the neuro-physiological process by Lazarus, Osgood and Dixon.

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NEWS OF THE WORLD

Nippon (Japan) Research Center (NRC) was established in Tokyo this spring, supported and financed by nine Japanese leading companies. It is a research and basic behavioral science organization which is designed to conduct basic researches as well as practical application, in order to apply fruits of behavioral and social sciences to actual use and to improve management, selling and advertising technologies and to analyze consumers' behavior scientifically. Economics and Industrial Administration Departmant, headed by F. Sakamoto, a well-known expert in that field, has some twenty scholars, and Psychology and Sociology Department lead by N. Ohkawa, has about forty young specialists. Prof. Hiroshi Minami of Hitotsubashi University, who took Ph. D. at Cornell, works as a consultant.

The Society for the Investigation of Human Ecology opened new offices under its new name "Human Ecology Fund" at 201 East 57th Street, New York 22, N. Y. on June 1, 1961.

Vol. 1, No. 1 (Winter 1961) of a new journal "*Review of Existential Psychology and Psychiatry*" was published by the Association of Existential Psychology and Psychiatry with the editor: Adrian van Kaam of Duquesne University, Dept. 135, Pittsburgh 19, Penn., U. S. A.

Dr. B. L. Atreya, formerly Professor of Banaras Hindu University, India, started "*Darshana - An International Quarterly of Philosophy, Psychology, Psychical Research, Religion, Mysticism and Sociology*". Managing editor is Prof. J. P. Atreya, his son, of K. G. K. College, Moradabad, India.

Dr. Peter A. Bertocci, Borden Parker Bowne Professor of Boston University, and his family stayed for about ten months in India as a Fulbright visiting professor, chiefly affiliated with Calcutta University, and visited Japan on their way home. By the introduction of Prof. G.W. Allport he came to see Dr. Sato in Kyoto in the fourth week of June and they were welcomed by the editorial staff of *Psychologia*.